AMERICAN MUSEUM
NOVITATES

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY
CITY OF NEW YORK MARCH 3, 1949 NUMBER 1411

NEW GENERA AND SPECIES OF HALACARIDAE (ACARI)

By Irwin M. Newell[1]

The Halacaridae of the eastern North Pacific are virtually unknown at the present time, except for three species described from Laguna Beach, California, by H. V. M. Hall (1912). These were very inadequately treated and only two of them have been identified by the writer in collections from the type locality, namely, *Copidognathus curtus* Hall, 1912, and *Agaue californicus* (Hall), 1912 (= *Copidognathus californicus* Hall). The third species, *Pontacarus californicus* Hall, 1912, is still unknown and may even be one of the species of *Rhombognathus* so abundant at Laguna Beach. The present paper describes three new species from the Pacific coast, all of which are unusual in a number of respects, and one of them is the type of a new genus, *Thalassacarus*, closely related to *Thalassarachna* Packard, 1871. The remaining two are representatives of established genera, *Agaue* Lohmann, 1889, and *Copidognathus* Trouessart, 1888.

In addition to the above new genus and species, additional notes are provided on two other genera, *Thalassarachna* Packard, 1871, and *Anomalohalacarus*, new genus. The validity of Verrill's *Thalassarachna* was established during the course of studies on the marine Halacaridae of eastern North America (Newell, 1945, 1947a), but at that time the writer retained it as a subgenus of *Halacarus* Gosse, 1855. It is now my belief that it should be regarded as a distinct genus since the species of the two groups differ consistently in several important respects. In addition the new genus *Anomalohalacarus* is established here for *Halacarus anomalus* Trouessart, 1894. *Anomalohalacarus* is not known from the North Pacific at present.

[1] Department of Biology, University of Oregon, Eugene, Oregon.

The figures were drawn by the author with the aid of a camera lucida. Scales are available for all figures, and these can be used to obtain measurements not given in the text. Each subdivision of the scale equals 10 μ, so that a scale with one division represents 10 μ, one with three divisions represents 30 μ, etc. In the scales that are 10 divisions long, a slightly longer mark has been made at the 50 μ point.

The standard abbreviations used in the monograph on the Halacaridae of eastern North America are used here for the following frequently recurring terms:

AD, anterodorsal plate
AE, anterior epimeral plate
GA, genito-anal plate
OC, ocular plate
P-3, palpal segment three
PD, posterodorsal plate
PE, posterior epimeral plate
I-6, segment six of leg I (or tarsus I)
III-3, segment three of leg III (or femur III)

The holotypes and some of the paratypes are deposited in the collection of the American Museum of Natural History.

THALASSACARUS, NEW GENUS

DIAGNOSIS: Palpi lateral in position, four-segmented, P-2 with a distidorsal seta, and P-3 bearing a dorsomedial seta as in *Thalassarachna*. P-4 with three large setae on the proximal half (fig. 15). Chelicera with a heavy dentate basal process. Bacillum of tarsus I on the lateral membrane of the claw fossa, that of tarsus II on the medial membrane (figs. 20, 21). Five pairs of setae in the dorsal body series (fig. 5). Genital sclerites of female without setae (fig. 4), adanal setae ventrolateral to anal papilla (figs. 1, 12).

GENOTYPE: *Thalassacarus commatops*, new species.

REMARKS: This genus falls in the subfamily Halacarinae Viets, 1927, and keys out to *Thalassarachna* in the author's key (Newell, 1947a, p. 22). It is nearest *Thalassarachna* but differs from all species of that genus in the form of the chelicerae, the ventrolateral position of the adanal setae, the absence of setae on the genital sclerites of the female, and the possession of rosette pores. *Thalassacarus* differs from *Copidognathus* in the seta on

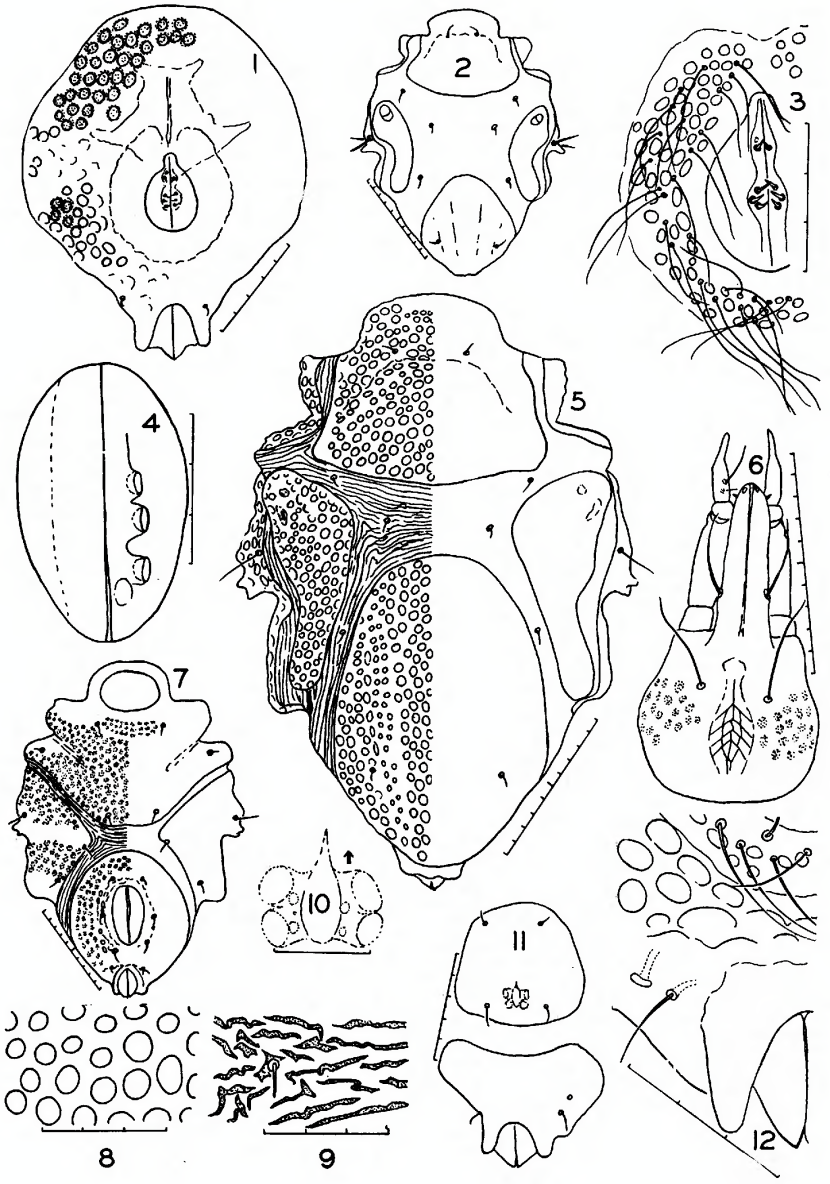
P-3, the disposition of the setae on the base of P-4, the form of the chelicera, the position of the bacillum (lateral on both tarsi I and II in *Copidognathus*), the absence of setae on the genital sclerites, the position of the adanal setae, and the chaetotaxy of I-5 and II-5. The similarity of the new genus to *Copidognathus* is largely superficial.

Thalassacarus commatops, new species

Figures 1–26

FEMALE: Body 344–378 μ long, 270–280 μ wide, length/width = 1.36–1.46; average 369.2 by 277.7 μ, length/width = 1.36 (based on one specimen from Pacific Grove and five from Laguna Beach, California). AD (fig. 5) uniformly convex along posterior margin, or irregularly convex as shown in the figure. Central portion of posterior half of AD forming an elevation rising above the level of the remainder of the plate, the single pair of setae lying at the anterior margin on the elevated portion. Rosette pores and porose areas lacking, entire plate rather uniformly marked with coarse, deep pits (fig. 8) which are variable in size on different parts of the plate. OC (fig. 5) of unusual form, with a heavy caudiform projection, reaching very nearly to insertion of leg IV; anterior cornea distinct, circular, posterior cornea less distinct. Elongate PD with only a single pair of setae (the fourth pair of dorsal setae lies in the membranous area between PD and OC). Membranous area mostly thick, parallel striae which anastamose occasionally and which are strongly wrinkled in the region of the third dorsal setae (fig. 9).

AE (fig. 7) with porose panels at the center of the plate which become markedly depressed towards the edge of AE and approach rosette pores in appearance. There is no pronounced ostium but only a deep pit of seemingly uniform diameter throughout its depth. A separate transverse band about equal in width to three porose panels lies between the first pair of setae of AE (fig. 7). PE with three setae ventrally, one dorsally, unpanelled areas as shown in figure. GA ovate, three pairs of setae by genital opening, and a fourth (adanal) pair lateral to the anal papilla and visible only in ventral view (fig. 12, male). These are the homologues of the setae that lie dorsal to the anus in species of *Thalassarachna*. Lateral limit of genital sclerite indistinct (fig. 4, right side), light sclerotization extending to sides



FIGS. 1–12. *Thalassacarus commatops*, new species. 1. Male, genito-anal plate. 2. Deutonymph, dorsum. 3. Male, genital area. 4. Female, genital opening. 5. Female, dorsum. 6. Female, capitulum, ventral view. 7. Female, venter. 8. Female, cuticle near middle of left posterior quarter. 9. Female, dorsal membranous area around third dorsal seta. The stippled areas are depressed. 10. Deutonymph, genital area. 11. Deutonymph, genito-anal area. 12. Male, posterior tip of GA.

of genital opening. Three pairs of genital suckers present (fig. 4 left side). No setae on genital sclerites.

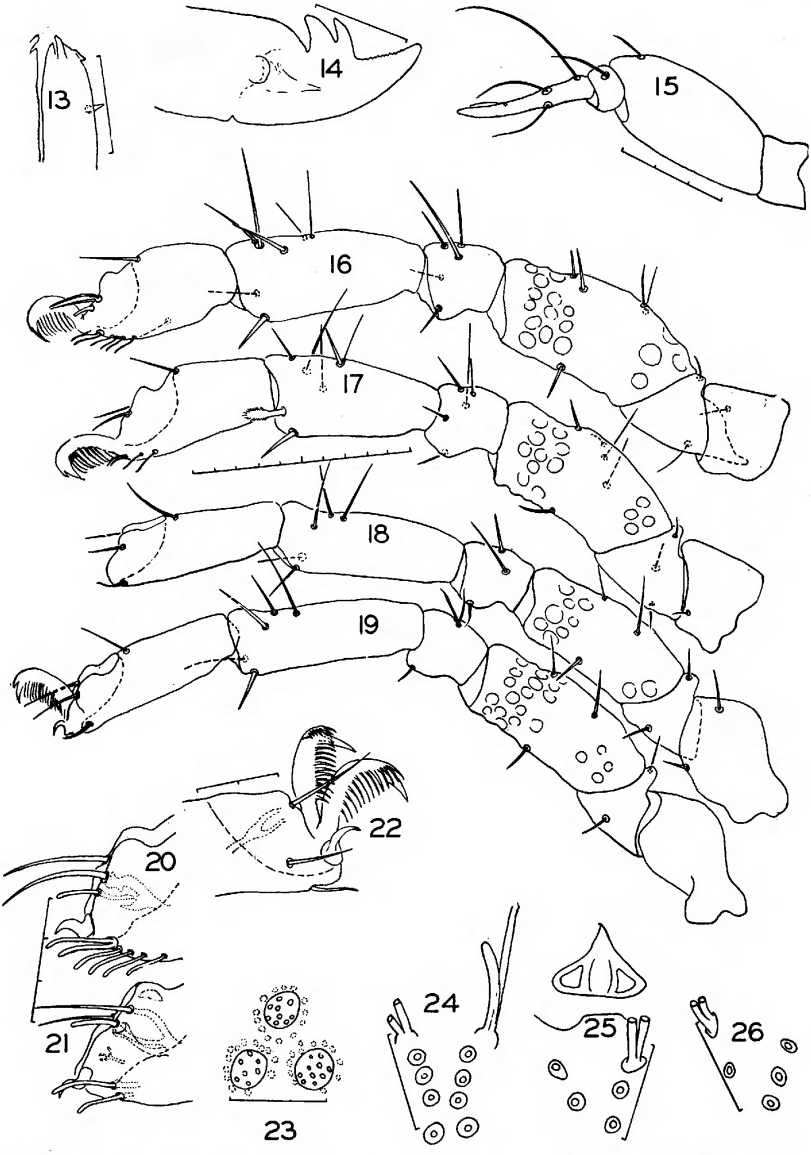
Rostrum (fig. 6) nearly parallel sided, reaching well beyond P-3; a pair of small spine-like setae near tip (fig. 13), and a barb-like structure (oil immersion) on the lateral convexity of the tip. Base of capitulum with depressed porose panels or rosette pores ventrally and dorsally. Pharyngeal plate and two pairs of large setae as shown. Palp (fig. 15) four-segmented, with a single seta distidorsally on P-2, a dorsomedial seta on P-3, three large setae on the basal half of P-4, and a very fine seta on the distal half. Chelicerae with distal half long and slender, gently bowed, movable digit of very unusual form, with two heavy basidorsal hooks, remainder of dorsal edge minutely serrate (fig. 14). The general form of the chelicera is roughly comparable to that of *Halacarus ctenopus* Gosse, 1855, except that the shaft in *Thalassacarus commatops* is more bowed (material not available for illustration of entire chelicera), and of course *H. ctenopus* does not have the hooks on the digitus mobilis. No cheliceral membrane.

CHAETOTAXY OF LEGS

	I				II				III				IV			
	d.	v.	l.	m.	d.	v.	l.	m.	d.	v.	l.	m.	d.	v.	l.	m.
1	—	—	—	1	—	—	—	1	1	1	—	—	—	—	—	—
2	1	1	—	—	1	1	1	—	1	1	—	—	1	1	—	—
3	4	1	—	—	3	1	1	—	2	1	—	—	2	1	—	—
4	3	1	—	1	3	1	1	—	2	1	—	—	2	1	—	—
5	5	1	—	1	4	1	1	1	3	2	—	—	3	2	—	—
6[a]	3	9	—	—	3	4	—	—	3	—	—	—	3	—	—	—

[a] These figures do not include the bacillum nor the parambulacral setae at the distal extremity of the tarsus. These are discussed separately in the text.

Setae of legs relatively short and showing many unusual characteristics. I-5 and II-5 with five setae dorsally, one ventrally and one medially, the latter being smooth on I-5 and pectinate on II-5. In addition to the three dorsal and nine ventral setae shown in the table for I-6, there is a bacillum on the lateral membrane of the claw fossa. Ventrally on I-6 there is a single seta about the middle of the segment, and more distally (figs. 20, 24) four pairs of curved bacilliform setae, and finally a pair of divaricate parambulacral setae on the tip of the tarsus. II-2 with a lateral seta (not present on I-2). II-6 with three



FIGS. 13–26. *Thalassacarus commatops*, new species. 13. Female, tip of rostrum, ventral view. 14. Female, chelicera. 15. Female, palp, medial view. 16. Female, leg I, lateral view. 17. Female, leg II, lateral view. 18. Female, leg III, lateral view. 19. Female, leg IV, lateral view. 20. Female, I-6, lateral view, lateral claws omitted. 21. Female, I-6, medial view, lateral claws omitted. 22. Female, III-6, ventromedial view. 23. Female, pores of AE, near leg I. 24. Male, I-6, ventral view of tip of I-6 of left side, showing chaetotaxy. 25. Female, II-6, ventral view of tip of II-6 of left side, showing normal chaetotaxy. 26. Female, II-6, ventral view of tip of II-6 of right side, showing exceptional chaetotaxy.

dorsal and three ventral setae in addition to the bacillum and parambulacral setae. The bacillum is on the medial membrane of the claw fossa rather than the lateral as is the case on I-6. Furthermore, a divaricate parambulacral seta is present only on the lateral side of the tarsus, the seta in the corresponding position on the medial side being single. In addition to the parambulacral setae there are three bacilliform setae just proximal to these, two lateral and one medial in position (fig. 25).[1] In one female (fig. 26) there were three setae medially and only one laterally behind the divaricate seta, but the other tarsus II was normal. Chaetotaxy of III and IV alike except for the trochanter (first free segment), which bears two setae on III, but none on IV. II-6 and III-6 each with a pair of simple parambulacral setae distally (fig. 22).

MALE: Body 338–358 μ long, 243–263 μ wide, length/width = 1.33–1.42; average 348.6 by 252.5 μ, length/width = 1.38 (based on four specimens from Laguna Beach, California). A single male from Yaquina Head, Oregon, was 385 by 280 μ, length/width = 1.38; or somewhat larger than the California females measured. Morphologically identical with female in all points mentioned above except characters of GA (figs. 1, 3). GA of same general outline as that of female, but rosette pores in three groups, a crescentic group anterior to the genital opening, and one group on either side of the opening. The number of pores varies greatly even in males from Laguna Beach, the male from which figure 1 was drawn having only four or five pores in the posterior groups, and about 75 in the anterior group, whereas in another male there are 15 to 18 and more than 100, respectively. The pores are of the type shown in figure 23. In the posterior groups there are a number of coarse, deep pits in addition to the rosette pores, and the remainder of the plate is smooth or irregularly roughened. Genital opening somewhat elevated above surface of plate, surrounded by a ring of deep pits and about 50 setae which are interrupted only an-

[1] This is not the only interpretation available here, since it is possible that neither of the two medial setae represents the parambulacral seta, and that the latter is therefore absent. Or it is also possible that the homologues of the two elements which make up the divaricate seta of the lateral side have become separated and are now represented by two single setae. But either one of these alternatives would be more exceptional than the one given above.

teriorly (fig. 3). Genital slit guarded by four (or five?) pairs of setae as shown. The most careful search of all available males showed no more than four pairs as indicated in the figure, but in some of these there was an additional alveolus-like structure associated with the anterior setae suggesting possibility of a minute fifth pair. Three pairs of internal genital suckers. Adanal setae as shown in figure 12, lateral to anal papilla, and visible only in ventral view.

DEUTONYMPH: Easily recognized by form of OC (fig. 2). Dorsal membranous area with thick, wrinkled striae (as in fig. 9, female); striae of ventral membranous area more uniformly parallel, but chaetography virtually identical with that of adult except for genito-anal region. Genital and anal areas (fig. 11) completely separated by striate cuticle. Genital plate with four setae; subgenital setae not found, but probably present. The four small circles in figure 10 represent refractile spots which may be the alveoli of four subgenital setae, but, if so, then these project into the subgenital chamber and do not project from the surface of the plate.

REMARKS: When first seen, this small species presents the general facies of a *Copidognathus*, a resemblance which is completely belied by a close morphological study. The form of the depressed porose panels (or rosette pores) demonstrates the impossibility of drawing a sharp distinction between these two types of structures, for the pores in this species are intermediate in form to the typical porose panels and rosette pores, although for the most part they more nearly approach the latter. The presence of this species at Laguna Beach, California, the type locality of *Copidognathus curtus* Hall, 1912, requires consideration of the possibility of identity of the two forms. This will not be presented here because a troublesome point in variation must be resolved before Hall's species can be fully clarified. The writer is certain that *Copidognathus curtus* is a true *Copidognathus*, and that it is by far the most common species of the genus at Laguna Beach. However, I have seen the species in collections ranging from Mexico to Oregon, and it is quite variable in its morphology throughout this range.

DISTRIBUTION: Oregon: Yaquina Head, male holotype (44° 41′ N., 124° 06′ W.), I. M. Newell. California: Crescent City (41° 45′ N., 124° 11′ W.), Leroy E. Detling; Pacific Grove (36°

39′ N., 121° 53′ W.), Borys Malkin; Laguna Beach (33° 35′ N., 117° 45′ W.), Borys Malkin.

Agaue bradypus, new species

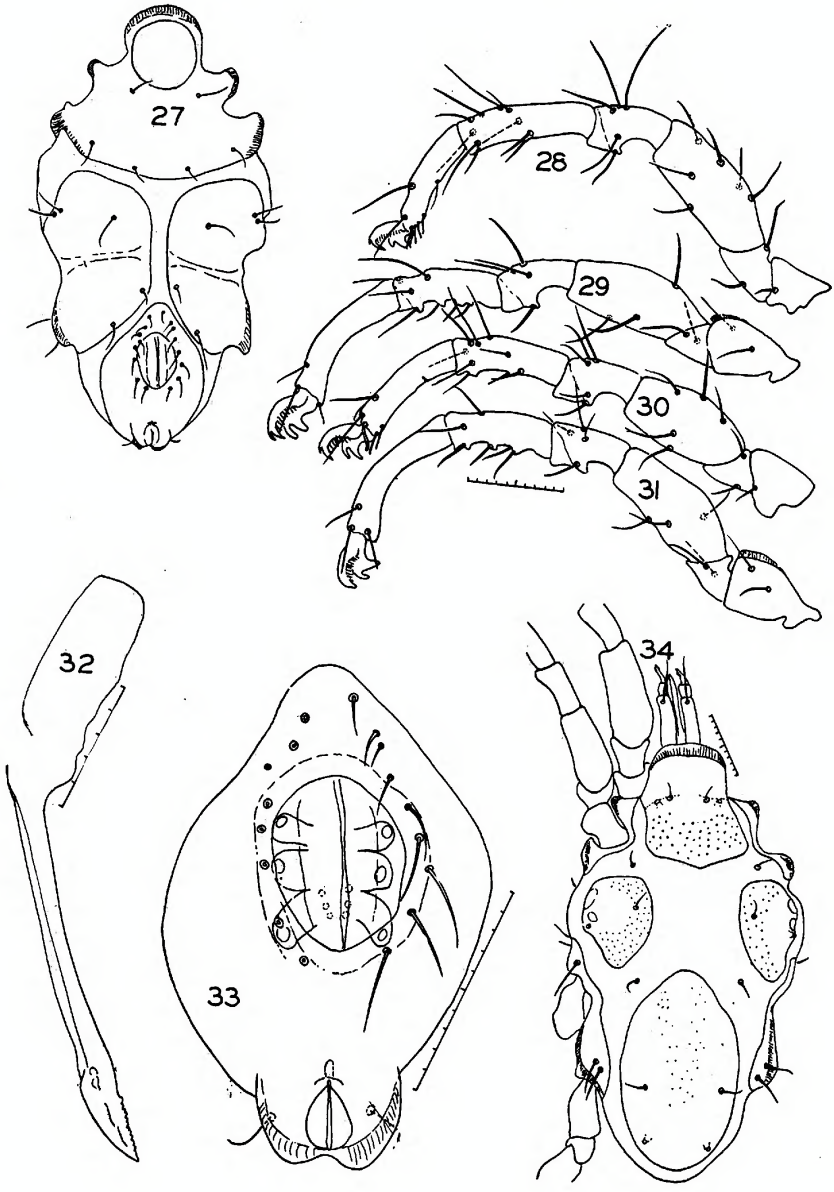
Figures 27–47

FEMALE: Body 682 μ long, 365–385 μ wide, length/width = 1.77–1.88, based on only two specimens from Crescent City, California. AD with a thick layer[1] of cerotegument. Remainder of AD without cerotegument, but posterior half of plate with pores of moderate size (1 to 2 μ); one pair of large pores at the level of the setae. OC with two corneae, behind which lies a coarse pore. Entire surface of plate, including the corneae, minutely punctate; pores and setae as shown in figure 34. PD completely surrounded by membranous area, and bearing only the fifth pair of dorsal setae; costae absent, one pair of pores near posterior end. Dorsal plates unpanelled. Dorsal membranous area finely striate, the striae wrinkled but parallel and showing only occasional anastamoses. Striae distinct in clean, but indistinct in fouled, specimens. Second and fourth pairs of dorsal setae in membranous area.

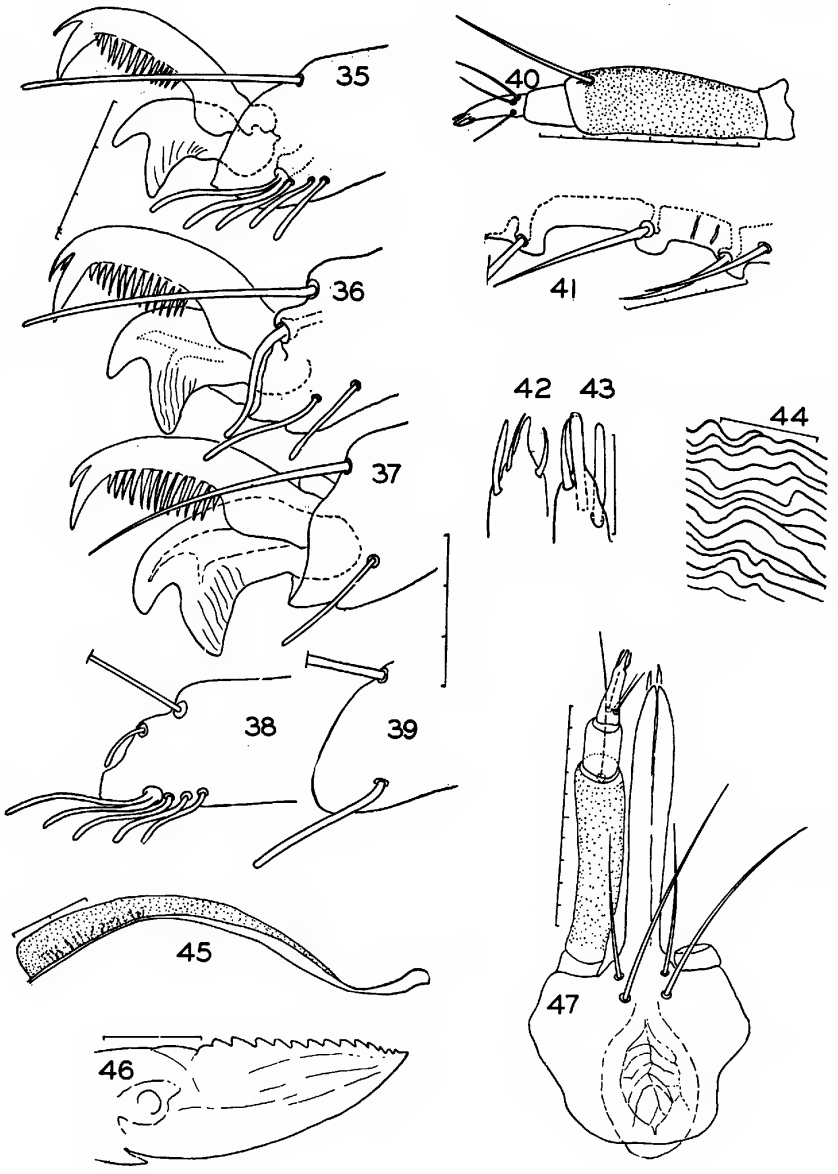
AE (fig. 27) minutely punctate, three pairs of setae as shown. PE almost entirely ventral, separated medially by only a thin band of striate cuticle; five pairs of setae ventrally and three pairs dorsally, two of the latter just anterior to insertion of leg IV. Epimeral areas III and IV set off by slightly depressed groove, but not by striate cuticle. GA (fig. 33) acutely rounded anteriorly. Adanal setae dorsolateral on anal papilla. Genital opening surrounded by 16 to 18 setae. Genital sclerites feeble, three pairs of internal genital suckers, proximal end of ovipositor slightly anterior to margin of GA. Ventral plates showing weakly developed panels which are not excavated. Cerotegument on margins of AE and PE, and on anal papilla as shown in figures. Ventral membranous area greatly restricted, marked with delicate parallel striae.

---

[1] This seems to be comparable with what Grandjean (1936a, p. 139; 1936b, p. 77; 1936c, p. 84) refers to as cerotegument in the Oribatoidea. Its finely branching internal structure and yellowish color give the distinct impression that this layer was laid down subsequent to the cuticle proper, through the extremely minute cuticular canals which are present on all plates. Material was not available to test for solubility in potassium hydroxide. Tests by the writer have shown the cerotegument in *Pelops* C. L. Koch, 1835, and other genera to be soluble in alkali.



FIGS. 27–34. *Agaue bradypus*, new species, female. 27. Venter, same scale as figure 34. 28. Leg I, medial view. 29. Leg III, lateral view. 30. Leg II, medial view. 31. Leg IV, lateral view. 32. Chelicera, medial view. 33. GA. 34. Dorsum.



FIGS. 35–47. *Agaue bradypus*, new species, female. 35. I-6, medial view. 36. II-6, medial view. 37. III-6, medial view. 38. I-6, lateral view, claws omitted. 39. II-6, lateral view, claws omitted. 40. Palp, medial view. 41. Ventral setae of IV-5, lateral view. 42. Distal end of P-4 of right side, ventral view. 43. Distal end of P-4, medial view. 44. Dorsal membranous area. 45. Optical section through dorsal wall of IV-1, showing cerotegument (stippled). 46. Chelicera, medial view. 47. Capitulum, ventral view.

Tips of palpi not quite reaching to end of I-3. P-2 porose, the pores of the same size as those on the dorsal plates. P-3 and P-4 combined 0.6 times as long as P-2. One large seta distidorsally on P-2, none on P-3, and three on the proximal half of P-4. Distal end of P-4 (figs. 42, 43) with three seta-like structures, the central one of which is very closely applied to the tip of the palp and therefore invisible in lateral view. Rostrum reaching beyond end of P-3, somewhat broader distally than near base. Base of capitulum minutely reticulate, two pairs of maxillary setae on the base of the capitulum. Pharyngeal plate greatly expanded (fig. 47). Chelicerae (figs. 32, 46) with a slender shaft that is much longer than the base. Cheliceral membrane absent, or at least not evident; digitus mobilis with 12 to 14 teeth.

Legs remarkably rigid, directed ventrally, and bowed, strongly suggestive of the legs of a sloth suspended from a limb of a tree. This, in combination with the enormously enlarged median claws provides the inspiration for the specific name.

CHAETOTAXY

	I				II				III				IV			
	d.	v.	l.	m.	d.	v.	l.	m.	d.	v.	l.	m.	d.	v.	l.	m.
1	—	—	—	1	—	—	—	1	1	—	1	—	1	—	1	—
2	1	1	—	—	1	1	—	—	—	—	1	1	—	—	1	1
3	4	1	—	1	3	2	1	—	1	2	—	—	1	2	—	—
4	3	2	—	—	3	2	—	—	1	1	1	1	1	1	1	1
5	4	4	2	—	3	4	2	—	2	4	1	—	2	4	1	—
6[a]	3	1	—	—	3	—	—	—	3	—	—	—	3	—	—	—

[a] Does not include the setae at the distiventral extremity, nor the bacillum. These are treated separately in the text.

I-6 (figs. 28, 35, 36) with three setae dorsally and one ventrally near middle, and in addition a bacillum on the lateral membrane; three pairs of bacilliform setae. II-6 (figs. 30, 36) with the characteristic three dorsal setae, but lacking the ventral seta near the middle of the segment (compare with I-6). Parambulacral setae not divaricate, but single. A bacilliform seta proximal to the medial parambulacral seta (fig. 36), but none found here in the corresponding position on the lateral side (fig. 39). Bacillum of II-6 on the medial membrane, much larger than that on I-6, and curved downward. III-1 and IV-1 with a small patch of cerotegument dorsally (figs. 29, 31). III-6 and

IV-6 with the usual three dorsal setae, and the single pair of parambulacral setae; bacillum absent. Tarsi II, III, and IV unusually sharply bent. Patella of all legs with ventral wall produced downward in such a way that the ventral margin appears sharply concave when seen in profile (figs. 28 to 31). Some of ventral setae on tibiae I–IV arising near or on heavy projections of the cuticle (fig. 41). Claw fossa very small, not adequate to enclose ambulacrum, lateral membranes small. Lateral claws pectinate, the pectinations readily visible at magnifications of 150 × or more. Accessory tooth present, distinct from rest of pecten, although it may contain two teeth. Median claw very heavy, brown in color, and ventral tooth striate. Cuticle of legs traversed by pores of moderate diameter (1–2 μ).

REMARKS: The clarity of the cuticular details of the mite varies considerably, apparently with age or degree of fouling with what is probably bacterial slime. In the older female of the two studied, it was difficult to make out either the margins of the plates or the striae of the membranous area. This same condition was observed in a nymph from Yaquina Head, Oregon, so that fouling of the cuticle is apparently common, if not characteristic of the species. Why most species of Halacaridae maintain a very clean cuticle while some do not is unknown. The cerotegument in this species does not form lamellae and sharp points as in *Agaue nationalis* Lohmann, 1893, but only low caps over certain portions of the body.

The form of the legs is so characteristic that the writer thought for some time that a new genus was involved, but as more detailed studies were made, it was found that this species differed in no significant way whatever from species of *Agaue* in regard to disposition of setae, form of chelicerae, palps, rostrum, and plates. In all such characters it proved to be a good *Agaue* species. The form of the legs appears to be a specific adaptation of some type.

This species is very closely related to *Agaue alberti antarctica* (Trouessart, 1907) with which it shares the following relatively unusual features: P-3 lacking a dorsal seta, tarsi bowed, median claw grossly thickened. These characters are found in *Agaue alberti alberti* (Trouessart) also, but the published descriptions of that species do not permit a comparison with the one described here. Judging from Trouessart's original description, *Agaue*

bradypus differs from *Agaue alberti antarctica* in the form of the genital plate, the number and distribution of the setae around the genital opening, and the presence of cerotegument. Other differences are apparent, but Trouessart's figures were not sufficiently reliable to make detailed comparisons. They were obviously drawn from a badly compressed specimen, and are somewhat generalized.

DISTRIBUTION: Oregon: Yaquina Head (44° 41′ N., 124° 06′ W.), I. M. Newell. California: Crescent City, female holotype (41° 45′ N., 124° 11′ W.), Leroy E. Detling.

Copidognathus pseudosetosus, new species

Figures 48–63

The following description is based only on forms from St. Paul Island, Alaska.

FEMALE: Body 459–513 μ long, 304–344 μ wide, length/width = 1.46–1.56, average 484.0 by 320.3 μ, length/width = 1.51 (10 specimens). AD (fig. 48) with a prominent frontal spine, variable in acuteness, but nearly always extending beyond the tip of the rostrum (fig. 51). Anterior porose area elongate, posterior areas generally separate, but occasionally coalesced (fig. 50). Setae anterior to posterior porose areas. Second pair of dorsal setae in OC, third pair in PD. Corneae normal, two pairs of porose areas on OC. Four rows of rosette pores on PD. All dorsal plates prominently panelled, the panels not subdivided, the dorsal edges of the walls between the panels often with tubercles (fig. 55). Rosette pores with large ostia but reduced canaliculi, structure sometimes obscure. The canaliculi of the rosette pores of PD open internally into a depression which underlies the external alveolus. Canaliculi frequently open into the floor of the alveolus. Membranous areas greatly reduced, the plates contiguous to a considerable extent and even overlapping. Only a few anastamosing striae between AD and PD.

AE and other ventral plates very unique and characteristic of the species, deeply panelled, and with several areas of rosette pores as shown in figure 60. Two pairs of porose areas ventrally on AE, PE, and GA. Panels weakly developed or absent in posterior third of middle of AE, replaced by coarse but simple pores. Ventrolateral portions of body with fovea-like depressions as out-

lined on the left side of the body in figure 60. Rosette pores with large ostia, canaliculi opening at various points over the entire floor of the alveolus. Figure 53 shows the appearance of the ventral plates from the inner surface of the cuticle. Membranous areas greatly restricted, plates almost entirely contiguous. Genital sclerites with a single pair of setae.

Rostrum not reaching to end of P-2, but chelicerae usually reaching beyond this point. Frontal process generally extending well beyond tip of rostrum (fig. 51). Only two pairs of maxillary setae present, the basal setae never triplicated as in the male (fig. 49). Base of the capitulum with large rosette pores reaching to sides of pharyngeal plate. Palpi (figs. 51, 62) unique in the genus in the possession of a distimedial spur (not a seta) on P-3 (fig. 62). Legs as described for male.

MALE: Resembling female in all respects except general size, maxillary setae, and structure of GA. Somewhat smaller than female, body 445–480 μ long, 287–314 μ wide, length/width = 1.47–160, average 461 by 300 μ, length/width = 1.54 (10 specimens). GA (fig. 52) with two areas of rosette pores as in female. Genital opening (fig. 63) surrounded by about 30 setae. Cuticle deeply panelled. A hyaline shelf projects beyond the surface of the body, just behind the genital opening. The panelling enclosed within the outline of the shelf in figure 63 is not on the shelf itself, which is completely smooth, but on the wall of GA dorsal to the projection. Genital sclerites with the usual four pairs of setae which are characteristic of the genus.

Capitulum with three pairs of maxillary setae on the base of the capitulum (fig. 49), rather than one as in the female. One specimen had three basal setae on one side, but two on the other, while another had three basal setae on one side but four on the other. Three pairs of setae on the base of the capitulum are, however, the normal number.

In a male of unknown body length the following measurements were obtained (for I-3, I-5, II-3, II-5 the height, exclusive of the ventral lamella, is also given):

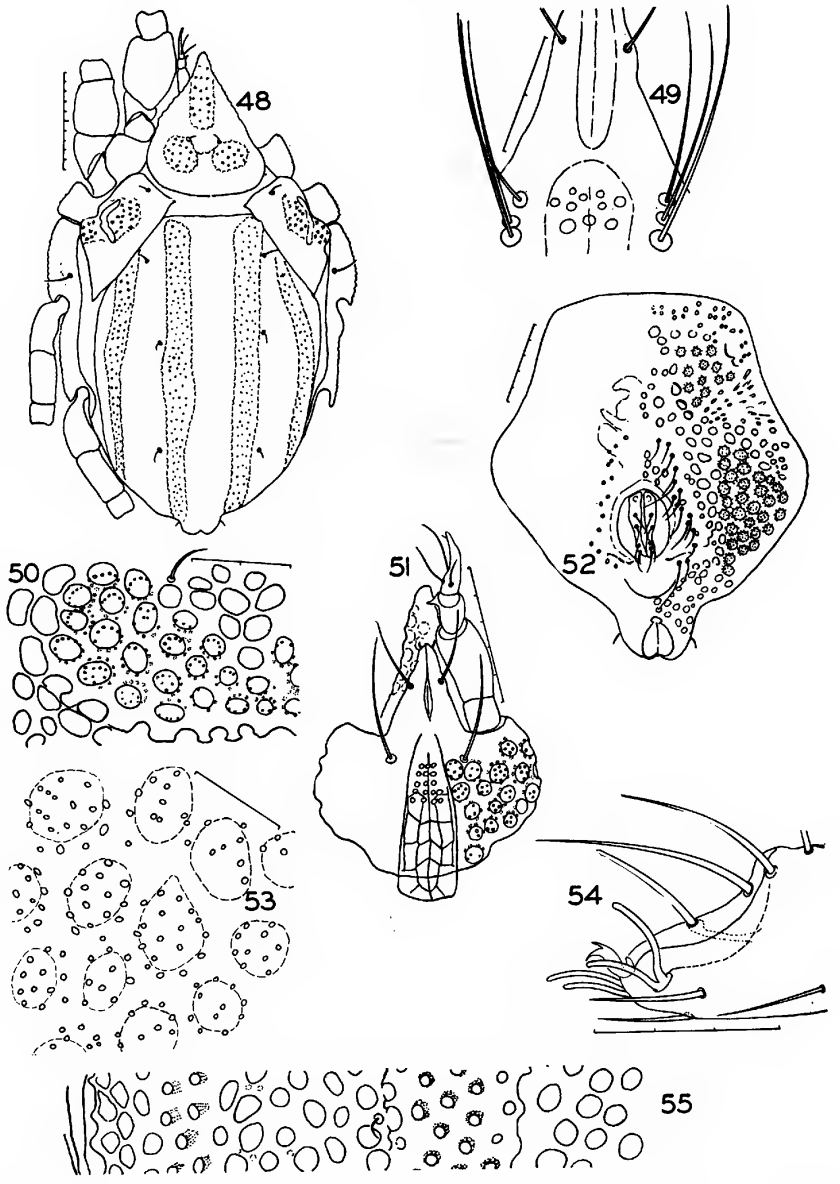
	1 + 2	3	4	5	6	Ambulacrum	Total
I	58 μ	82/60	27	79/41	53	28	323
II	58	69/49	26	64/38	61	31	309
III	72	58	23	66	72	31	322
IV	75	60	22	66	77	35	335

CHAETOTAXY

	I				II				III				IV			
	d.	v.	l.	m.	d.	v.	l.	m.	d.	v.	l.	m.	d.	v.	l.	m.
1	—	—	—	1	—	—	—	1	—	1	—	—	—	—	—	—
2	1	1	—	1	1	1	—	—	1	1	—	—	1	1	—	—
3	3	1	1	—	3	1	1	—	2	—	—	—	2	1	—	—
4	2	2	—	—	2	2	—	—	1	1	1	—	2	1	—	—
5	4	1	—	2	4	1	—	2	2	3	—	—	2	1	1	1
6	3	3	—	—	3	—	—	—	4	—	—	—	3	—	—	—

Leg I (fig. 56) when naturally extended, about 0.52–0.57 times as long as body (three specimens). Femora I and II swollen, 1.47 and 1.41 times as long as high, not including the ventral lamella, deeply panelled, without rosette pores or porose panels. Remainder of segments of legs I and II with minute panels, reticulate in appearance (650 ×). Ventromedial setae of I-5 and II-5 flattened, pectinate (oil immersion). I-6 (fig. 54) with three setae dorsally and three ventrally in addition to the divaricate parambulacral setae and the bacillum. Bacillum lateral in position. II-6 (fig. 57) lacking the three ventral setae, otherwise similar to I-6 in chaetography. III-5 with medial member of distiventral groups pectinate, the others smooth, all three distiventral setae of IV-5 smooth. III-6 with four setae dorsally, IV-6 with three. III-6 with parambulacral setae not divaricate, but single, greatly reduced, the medial member of the pair usually simple, setiform, the lateral member evidently broad, palmate, but impossible to delineate even under oil immersion. Both members of this pair are palmate on IV-6, and in one male both members on III-6 of the right side were apparently palmate. III-3 and IV-3 with a ventral tuberosity near the base (variable?), easily seen in lateral view but not in ventral view. Both III-6 and IV-6 lack ventral setae (excluding the parambulacral setae). Panelling on legs III and IV similar to that on I and II, but less prominent. All tarsi with claw fossa and membranes, all claws distinctly pectinate but with no real accessory tooth. An apparent accessory tooth is visible on claws viewed from the ventral side but is not seen in lateral view. Median claw very small, slender, especially on III and IV.

REMARKS: Although there is no question of this species being a *Copidognathus*, there are a number of features which have not been observed heretofore in other species, notably the extreme development of rosette pores, the prominent frontal process of



FIGS. 48–55. *Copidognathus pseudosetosus*, new species. 48. Female, dorsum. 49. Male, capitulum, ventral view. 50. Female, left posterior porose area, and a portion of the right, from a specimen in which the posterior porose areas are coalesced. 51. Female, capitulum, ventral view. 52. Male, GA. 53. Male, internal surface of PE. Ostia of rosette pores (external surface) shown by dashed lines. 54. Male, I-6, medial view, lateral claws omitted. 55. Female, PD at level of left fourth dorsal seta, same scale as figure 63.

FIGS. 56–63. *Copidognathus pseudosetosus*, new species. 56. Male, leg I, medial view. 57. Male, leg II, lateral view, II-1 missing. 58. Male, leg III, medial view. 59. Male, leg IV, medial view. 60. Female, venter, same scale as figure 48. 61. Male, left palp, ventrolateral view. 62. Male, left P-3, anteroventral view. 63. Male, genital area.

AD, the triplication of the basal pair of maxillary setae of the male, the spine on the medial surface of P-3, and the hyaline shelf behind the genital opening of the male. The features of the capitulum deserve particular note. When first seen under low magnification, the spine on P-3 bears a deceptive resemblance to a seta, such as is found in *Halacarus*, *Thalassarachna*, and *Agauopsis*, to mention a few examples. But when examined under oil immersion, it becomes evident that this is only a superficial resemblance. The spine is a simple continuation of the wall of P-3, and there is not the least suggestion of an alveolus. Furthermore it lies at the distal end of the segment, whereas the seta of P-3 in species of other genera lies somewhat proximal to this point. Of course it is not impossible that this spine is produced by the same cell which produces the shaft of the seta in other genera, for the present genus, *Copidognathus*, was almost certainly derived from forms which had a seta on P-3. Such a seta is present, for example, in *Agauopsis* which undoubtedly is more closely related to *Copidognathus* than to any other genus. It is not impossible that many species of *Copidognathus* possess a trichogen in P-3 with limited seta-forming potentialities. But since the true setae of mites, like those of insects, are probably developed by the interaction of two cells (a trichogen which produces the seta; a tormogen which produces the alveolus and alveolar membrane), the absence of the latter would inhibit the expression of the potentialities of the trichogen except in exceptional cases of which this species may be an example. The dual origin of the true setae of mites is strongly suggested by cases in which it is apparent that the tormogen is functional while the trichogen is lost or is nonfunctional. The hyaline rings characteristically found in the cuticle of species of *Orthohalarachne* Newell, for example (Newell, 1947b, pp. 253, 264, figs. 20, 42, 46, 62), give every indication, by their position, of being the result of residual tormogens, the associated trichogens having become inactive for one reason or another. A number of unusual structures of the cuticle of mites could probably be explained on the basis of atypical interaction of trichogens and their associated tormogens. It should be evident, too, that it is necessary to draw as sharp a line as possible between true setae and structures of similar form which may simply be atypical, or which have no relationship whatever to setae, but are just local projections of the cuticle.

The triplication of the basal maxillary setae (fig. 49) of the male is another unusual feature of this species. In the female there is a single pair of these on the base of the capitulum (fig. 51). In view of the variation pointed out in the diagnosis above, it is to be expected that in rare instances specimens will be found which have only two basal maxillary setae on each side, whereas others will be found which have four on each side. These would have no taxonomic significance, of course.

The species is immediately recognizable in all parts of its known range on the basis of the spine on P-3, the triplication of the basal maxillary setae of the male, the distribution of rosette pores on the ventral plates, and the chitinous shelf posterior to the male genital opening. Variations are noticeable, however, the forms from St. Paul Island being larger and more heavily panelled and sculptured. Also the cuticle is somewhat pigmented in the St. Paul forms, an unusual feature in *Copidognathus*, whereas it is essentially colorless in specimens from Oregon and northern California. The differences cannot be assigned any systematic significance, however, since they are just as likely due to ecological differences as to genetic differences. The following table indicates the magnitude of the size differences (the figures give the length in μ).

	St. Paul I., Alaska	Yaquina Head, Oregon	Winchester Bay, Oregon	Crescent City, California
Males	445–480 μ	338–344 μ	358–371 μ	344–358 μ
Number	10	3	4	2
Females	459–513 μ	338 μ	358–385 μ	385 μ
Number	10	1	5	1

The forms from Winchester Bay had very short frontal spines, not even reaching to the middle of P-2, whereas in the forms from St. Paul, Yaquina Head, and Crescent City, the spines reached to or beyond the end of P-2. The difference was very noticeable, and some 20 specimens from Winchester Bay were examined, so that the difference is also statistically significant. It is impossible to say at present whether the difference is induced ecologically or genetically.

Distribution: Alaska: St. Paul Island, Bering Sea (57° 05′ N., 170° 25′ W.), male holotype, Victor B. Scheffer. Oregon: Yaquina Head (44° 41′ N., 124° 06′ W.), I. M. Newell; Winchester Bay (43° 40′ N., 124° 12′ W.), I. M. Newell. California:

Crescent City (41° 45′ N., 124° 11′ W.), Leroy E. Detling. The species did not appear in collections from Pacific Grove (36° 39′ N.), or at any point south of there.

THALASSARACHNA PACKARD, 1871

Further consideration of the characters of *Thalassarachna* Packard, 1871, leads the writer to believe that it should be considered a distinct genus rather than a subgenus of *Halacarus* Gosse, 1855. The important character of the shortened fourth segment of the legs is one that has never been shown to intergrade with the condition in *Halacarus* in which the third, fourth, and fifth segments are approximately equal. The presence of two setae on the second segment of the palp in *Halacarus* contrasted with the single seta found here in *Thalassarachna* is another character in which there appears to be no overlapping. Also the large pores of *Halacarus* surrounded by heavy chitinous rings, the striated cuticle covering the plates and legs, and the characteristic form of the genito-anal plate of the females are additional characters which clearly set off all or nearly all species of *Halacarus* from those of *Thalassarachna*. Accordingly the writer regards these two groups of species as discrete genera.

ANOMALOHALACARUS, NEW GENUS

Ever since its original description, *Halacarus anomalus* Trouessart, 1894, has been considered simply an aberrant species of *Halacarus*. However, it differs from species of *Halacarus* in so many respects that it seems unnatural to retain it in that genus. The following diagnosis appears to warrant separate generic status for this form: PD and AE divided into right and left halves. Palpi relatively straight, not geniculate, P-2 with no setae dorsally (Trouessart, 1894, pl. 10, showed a single seta dorsally, which requires verification), or at least without the two setae characteristic of *Halacarus*. PE with only the usual three ventral setae, the dorsal seta lying in the membranous area.

TYPE: *Anomalohalacarus anomalus* (Trouessart), 1894 (= *Halacarus anomalus* Trouessart, 1894).

REMARKS: *Anomalohalacarus*, new genus, differs from known species of *Halacarus* Gosse, 1855, in all of the characters listed above, and further studies will probably reveal others equally significant. One of these is the structure of GA, which may be

almost entirely wanting in the new genus. In the female genital area (Newell, 1947a, p. 99, fig. 130) the genital opening is bordered by two large plates which are more likely enlarged genital sclerites rather than the rudiments of a divided genital plate as hitherto believed. The genital plate is probably represented by the small plate directly posteror to the genital opening.

Thus far the genus includes only the genotype, but the recognition of its true generic status, combined with more detailed descriptions of forms from all parts of the range of the genus, may result in the distinction of other species. *Anomalohalacarus* is known only from the North Atlantic at present, ranging from the English Channel into the North Sea and the Baltic, and from North Carolina to New Brunswick, but probably extends farther north.

REFERENCES CITED

GRANDJEAN, FRANÇOIS

1936a. *Microzetes auxiliaris* n. sp. Bull. Mus. Natl. Hist. Nat., Paris, vol. 8, pp. 138–145.

1936b. Les Microzetidae n. fam. Bull. Soc. Zool. France, vol. 61, pp. 60–93.

1936c. Les oribates de Jean Frédéric Hermann et de son pére. Ann. Soc. Ent. France, vol. 105, pp. 27–110.

HALL, HARRY V. M.

1912. Some marine and terrestrial Acarina of Laguna Beach. Ann. Rept. Laguna Marine Lab., Pomona Coll., vol. 1, pp. 177–186.

NEWELL, I. M.

1945. The status of *Thalassarachna verrilli* Packard 1871, *Halacarus* Gosse 1855, and *Copidognathus* Trouessart 1888 (Acari, Halacaridae). Trans. Amer. Micro. Soc., vol. 64, pp. 58–62.

1947a. A systematic and ecological study of the Halacaridae of eastern North America. Bull. Bingham Oceanogr. Coll., vol. 10, pp. 1–232.

1947b. Studies on the morphology and systematics of the family Halarachnidae Oudemans 1906 (Acari, Parasitoidea). *Ibid.*, vol. 10, pp. 233–266.

TROUESSART, E. L.

1894. Note sur les acariens marins (Halacaridae) récoltés par M. Henri Gadeau de Kerville, sur le littoral du départemente de la Manche (Juillet-Août, 1893). Bull. Soc. Sci. Nat. Rouen, pp. 139-175 pls. 7–11.

1907. Acari. Halacaridae (acariens marins). Expéd. Nat. Antarctique, pp. 1–6.